EX PARTE OR LATE FILED

April 27, 1998

Ms. Magalie Roman Salas
The Office of the Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

Dear Ms. Salas:

Re: CC Docket No. 97-160; Response to March 24, 1998, letter Seeking Voluntary Submission of Geocoding Data

With this letter, Nevada Bell, Pacific Bell and Southwestern Bell Telephone Company (collectively, "the SBC LECs") submit their voluntary response to the Commission's request for information about the extent to which geocoded customer data is available to non-rural incumbent local exchange carriers.[1] The responses are attached to this letter, which provides an overview of the availability and value of the geocode data that currently exists.

Introduction

Geocoding is only one of several necessary steps in developing a cost model which will yield more accurate and reliable results. The SBC LECs preserve their argument that the use of a universal service cost proxy model that does not rely on specific or actual cost data will necessarily yield results that contradict the Act's requirement for the adoption of a "specific, predictable and sufficient"[2] universal service cost mechanism.

This Commission should not readily accept that geocoding, as it exists today, is the solution that will remedy the deficiencies of the proposed universal service cost proxy

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[1] Letter from A. Richard Metzger, Jr., Chief, Common Carrier Bureau, to John Schrotenboer, Southwestern Bell dated March 24, 1998 requesting voluntary responses to four items by April 27, 1998, CC Docket 97-160.

[2] 47 U.S.C. Section 254(b)(5).

models. Rather, much work remains to be done to effect geocoding processes appropriate for universal service cost and support identification. Moreover, geocoding processes are burdensome, expensive and continuous. The data must be constantly reviewed, updated and retested to eliminate the multitude of errors prevalent in such processes. With respect to universal service applications, the Commission must recognize that the very customer locations that are most likely not to be successfully identified in a geocode environment are those for which universal service support is most warranted (e.g., high-cost, rural areas). For these reasons, the Commission must understand as it reviews the SBC LECs' responses that a success rate ranging from 76% to 86% (i.e., as indicated for SWBT's five states) is not as indicative of success as it might otherwise seem. The 14% to 24% of customers who have not been successfully geocoded account for a disproportionate share of the universal service support requirement.

Geocoding

In the most fundamental sense, geocoding is the process of assigning coordinates to a geographic feature based on some other location description. However, geocoding most often refers to a process known as *Address Matching*, in which a location is assigned a respective global coordinate (latitude, longitude) position. The global coordinate is determined by locating the specific address (i.e., that information used to locate a particular street location) within an address range in a target address table. The target address table contains latitude, longitude coordinates for points along each line segment (i.e., street). It is used by the geocoding software to assign latitude, longitude coordinates to a specific address being matched.

No matter how complete an address file is, its elements can only be geocoded if the street and address can be cross-referenced to an address range and street in the target address table. Thus, geocoding is dependent on the accuracy and completeness of the target address table and the street address itself. For the majority of situations, a specific street address can be cross-referenced to a latitude and longitude.

The target address table includes address ranges as determined by the endpoints of specific street segment (i.e., a "line segment"). The specific location of the address is interpolated based on the relative position of the address value to the start and end address values for the street segment.[3] Understandably, shorter street segments will

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[3] For example, geocoding an address of 50 Main Street on a street segment with a start point value of 1 Main Street and an end point value 100 Main Street would produce an interpolated location at the street segment midpoint. However, dependent on lot sizes

(continued...)

minimize the opportunity for errors due to such interpolation. Generally, urban areas will have shorter street segments due to the frequent presence of cross streets. Conversely, rural areas will have longer line segments due to a lower frequency of cross streets. Therefore, rural address matching inherently incorporates an increased level of estimation regardless of the accuracy and specificity of the address information.

Moreover, in rural and sparsely populated areas specific address information may not be available. Instead of the traditional address configuration (e.g., 123 Main Street, Anywhere, Anystate, 12345), analysts are faced with the tremendous task of determining the location from a nebulous indicator such as "County Road 123," "Rural Route 1," or "P.O. Box 123."[4] Geocoding of such address configurations is unlikely, but will depend on the geocoding software. Obviously such information provides little, if any, specific detail as to a definitive geographic location for the entity in question.[5]

Further exacerbating the matter is the influence of incomplete, ambiguous, or otherwise indeterminate data that has the appearance of accuracy due to its specificity, even though wholly inaccurate. This includes those addresses which have been incorrectly coded (e.g., misspellings, wrong zip codes or house numbers), for which duplicate street names may exist, or for which the previously identified location no longer exists (e.g., the demolition of a multi-entity development which is replaced by a single-entity development).[6]

Another point which must be considered is the preciseness of the data underlying the target address tables. Most address matching software is based on Topologically Integrated, Geographically Encoded Referencing (TIGER) line files from the U.S.

(...continued)
and address assignments, this may not be the actual location of the address along that street.

[4] It should be noted that, in many cases, the location of the mail drop (e.g., post office box, mail box) may be a significant distance from the actual location at which the customer's telephone service is provided. For example, a P.O. Box address could, at best, produce a geocode of the post office location and might result in the location of the centroid (i.e., center point) of the ZIP code polygon in which the post office is located.

[5] Comments of TDS Telecommunications Corporation on Customer Location Issues, CC Docket 96-45 and CC Docket 97-160, pg. 15.

[6] Comments of GTE Service Corporation, CC Docket No. 96-45 and CC Docket No. 97-160, September 2, 1997, pg. 10 (redacted version).

Census Bureau. The TIGER files are relatively accurate and more complete address range-wise at the entire country level than anything else available, but "positionally," TIGER files are not accurate.[7] TIGER files were intended to assist with Census taking, not precisely positioning the nation's street and road system. The location and paths of the street and roads were greatly generalized due to storage and time constraints associated with such an immense amount of data. Thus, a winding street or road would have been resolved to a number of straight lines connecting such that the major bends of the street or road would be represented.

Additionally, streets and roads in rural areas contain many un-named and un-numbered address ranges. It is therefore impossible to match customers to these street segments with any degree of certainty.

For these reasons (e.g., address accuracy and specificity, completeness and preciseness of the software, and interpolation errors), geocoding is not as exact a process as one might believe.

The Apparent Success Of Geocoding Efforts Must Not Be Overestimated As It Applies To Universal Service Applications

Although SWBT is able to demonstrate a geocoding success rate[8] ranging from 76% to 86% for its five-state region, *the devil may indeed be in the details*. Such an overall success rate, while commendable in light of the aforementioned roadblocks, may in fact not be sufficiently reliable for use in the context of universal service support. Given that the figure is an overall figure, it understates the success rate in more urbanized areas (including downtown areas in rural areas), and overstates the success rate in rural areas – where the need for high-cost support is the greatest. Using such "averaged" data introduces unreasonable assumptions into any cost modeling for determining universal service support.

Generally, high success rates are more readily achievable due to the substantial number of traditional address configurations that exist and to the error correction capabilities that have been incorporated into geocoding software (e.g., Geographic Information System). As a rule, however, these traditional address configurations are

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[7] Several companies sell Enhanced TIGER data which, for the most part, contain updated address ranges, but rarely additional streets or positional corrections of streets. Periodically, the Census Bureau releases updated TIGER files.

[8] Success rates refers to the percentage of locations which have been assigned a longitude and latitude.

associated with urban, suburban and other densely populated areas. These are the very areas for which universal service support, especially high-cost support, is not likely necessary.[9]

Yet the unidentified SWBT customer locations comprising the 14% to 24% that have not been geocoded most likely represent those customers located in rural or sparsely populated areas.

That conclusion is based upon a SWBT analysis of geocoded customer location data for two of its exchanges in Texas using data that was available from E911 agencies. For the Vernon, Texas exchange, customer locations that were able to be geocoded were mapped. Comparing geocoded information to the information from the Texas NORTEX 911 Communications District, the clear conclusion was that customers who were successfully geocoded by address were located primarily within or near the city limits of Vernon, Texas.

The geocoding software was unable, however, to identify the latitude, longitude of the majority of customers in the rural Census Block Groups (CBGs) in the Vernon exchange. Using rural addressing map data obtained from the District and SWBT's facility records, SWBT personnel manually mapped the positions of access lines of customers who could not be geocoded to CBGs. The failure rate (e.g., percentage not geocoded that had to be manually mapped as compared to total locations in CBG) for the non-downtown CBGs ranged from 4.6% to 98.2%, with the percentage increasing the further away from the downtown area the CBG is located.

SWBT's analysis of the Albany, Texas wire center further confirmed this urbanized/rural disparity in geocode data. For E911 purposes, the West Central Texas Council of Government had gathered latitude and longitude position data of households using a Global Positioning System (GPS) receiver. This data was obtained from the District and then mapped against the customers who were able to be geocoded using commercial off-the-shelf address matching software and the Census TIGER file. Again, it was apparent that the locations that were able to be geocoded using addresses were those within or near the city limits of Albany, Texas; addresses further from the city limits could not be matched using geocoding software.

Not coincidentally, those areas where geocoded data was unavailable or failed are the very high-cost areas and customers for which universal service support is needed.

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[9] Comments of TDS Telecommunications Corporation on Customer Location Issues, CC Docket Nos. 96-45 and 97-160, September 2, 1997, p. 13.

It must be noted that most E911 agencies in Texas – and probably elsewhere for that matter – do not have the data that was available for Vernon and Albany, and that the boundaries of E911 system and associated location information do not match exchange boundaries or CBGs. In fact, a rural part of the Albany exchange in Stevens County, Texas where SWBT has customers was not analyzed because the E911 provider had not gathered the GPS location data. Accordingly, although the available data from those two agencies provided a good check on the completeness, accuracy, and overall reasonableness of geocode data, the Commission should not assume that resorting to and relying upon E911 agencies will fill a "data gap." Moreover, in light of the need for manual mapping where the need for support is the greatest, the use of any such process on a nationwide scale would be daunting.

Cost results premised on geocoding data skewed to metropolitan areas will necessarily produce support requirements that are lower than needed for "specific, predictable, and sufficient" support. Therefore, any such data (and the models into which this data is to be incorporated) should be further developed and improved to ensure the results are accurate and reflective of the actual costs of providing service in rural, high-cost areas.

Conclusion

Should you have any questions, please do not hesitate to call me at 314-235-8160.

Sincerely,

John W. Schrotenboer
District Manager - Embedded Cost Studies

Attachment

cc: ITS, Inc.
Ms. Sheryl Todd, Universal Service Branch
Parties of Record in CC Docket No. 97-160

THE SBC LECs VOLUNTARY RESPONSES TO THE COMMISSION REQUEST FOR INFORMATION

Data Request Item (1):

For each state in which you provide local exchange service as an incumbent local exchange carrier, please submit a description of the extent of the data, including geocoded data contained in E911 databases, that you control, manage, or to which you have access that identify the geocoded location of any of your customers.

The geocoded data that SWBT has as indicated below is stored in a company database, and is the result of SWBT's use of geocoding software.

Neither Pacific Bell nor Nevada Bell have geocoded data although Pacific has some limited location information as described below.

There is no geocoded data in E911 databases; they are limited to name, address, and telephone number.

Identify geocoded customers as a percentage of the number customers you serve in each state.

STATE	PERCENT CUSTOMERS GEOCODED To latitude and longitude
ARKANSAS	76%
CALIFORNIA	0%
KANSAS	86%
MISSOURI	82%
NEVADA	0%
OKLAHOMA	79%
TEXAS	83%

Data has been developed in California on individual projects for subsets of customers, but no comprehensive database has been developed or maintained that would provide geocoding information by latitude and longitude. For the California Universal Service Fund, customers were associated with Census Block Groups (CBGs), but no identification was preserved that identified customer latitude and longitude. No customer geocoding has been done in Nevada.

Identify the geocoded customers in rural areas as a percentage of the total number of customers that you serve in rural areas of each state.

Customers are not identified as rural or non-rural in SBC's recordkeeping process. The attached table provides a listing of the Geocoding Success Rate by line size of the office. Generally, smaller line size offices are located in rural areas, although there are some small line size offices that are in non-rural areas.

Identify the geocoded customers in non-rural areas as a percentage of the number of customers that you serve in non-rural areas of each state.

Customers are not identified as rural or non-rural in SBC's recordkeeping process. The attached table provide a listing of the Geocoding Success Rate by line size of the central office. Generally, smaller line size offices are located in rural areas, although there are some small line size office that are in non-rural areas.

Develop a reasonable set of criteria for distribution between rural and non-rural areas, to determine which areas are rural and non-rural, based on your recordkeeping. Provide an explanation of those criteria.

Customers are not identified as rural or non-rural in SBC's recordkeeping process. The attached table provide a listing of the Geocoding Success Rate by line size of the office. Generally, smaller line size offices are located in rural areas, although there are some small line size office that are in non-rural areas.

Data Request Item (2):

Describe how the geocoded data were collected, including whether the geocoded data describing the customers' locations are based on a customer's street address, on an inhabited structure, or on another geographical point that relates to the customer.

Geocoded data was obtained by processing current, active customer service addresses through geocoding software.

Describe whether geocoding software and/or geopositioning technology were used in the collection of the data.

Geocoding software is used to determine the latitude/longitude of customer service locations. Global Positioning Systems (GPS) have

not been used to collect geocoded data for customer locations.

Describe the frequency that such geocoded data are collected and updated.

Data is processed monthly to reflect new additions and deletions.

Data Request Item (3):

State whether the geocoded data were collected for E911 purposes.

Data was not collected for E911 purposes, nor was data collected from E911 information.[1]

Data Request Item (4):

Describe any plans to obtain geocoded data for additional customer locations in the future.

There is a proposed project to geocode all business and residential customer service addresses. However, there is no plan to correct any data errors or addresses that are unable to be geocoded. It is not anticipated that the number of geocoded customers will significantly exceed the geocoding success rate of 76% to 86% already achieved by SWBT. Further, as with any address matching, it will likely be more accurate and complete in more urban areas than in the rural areas.

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[1] Local political subdivisions within the State may use telephone company street address data in conjunction with other resources to geocode customer locations for E911 purposes. Not coincidentally, these entities discovered it difficult to map the majority of customers in rural areas.

PERCENT OF LINES GEOCODED BY WIRE CENTER LINE SIZE

State	WIRE CENTER LINE SIZE	Number of Wire Centers	Number of Accounts	Percent of Accounts Geocoded
AR	Under 500	15	6,314	16.27%
	500 to 1,000	24	16,666	15.49%
	1,000 to 2,000	24	36,667	45.60%
	2,000 to 3,000	8	22,213	63.61%
	3,000 to 5,000	16	63,211	67.15%
	5,000 to 10,000	26	187,171	69.67%
	Over 10,000	24	485,568	85.13%
	AR Total	137	817,810	75.89%
KS	Under 500	17	5,919	34.11%
	500 to 1,000	33	23,310	46.34%
	1,000 to 2,000	40	57,641	62.74%
	2,000 to 3,000	15	37,514	71.63%
	3,000 to 5,000	14	57,197	78.18%
	5,000 to 10,000	18	132,641	77.94%
	Over 10,000	32	875,858	91.82%
	KS Total	169	1,190,080	86.39%
MO	Under 500	15	4,360	13.88%
	500 to 1,000	37	28,136	25.07%
	1,000 to 2,000	27	38,012	33.01%
	2,000 to 3,000	21	51,077	36.81%
	3,000 to 5,000	19	72,618	62.01%
	5,000 to 10,000	37	264,305	60.44%
	Over 10,000	60	1,688,941	90.38%
	MO Total	216	2,147,449	82.43%
OK	Under 500	30	9,291	10.18%
	500 to 1,000	28	19,591	16.36%
	1,000 to 2,000	36	52,910	45.21%
	2,000 to 3,000	20	50,751	52.49%
	3,000 to 5,000	24	91,044	50.30%
	5,000 to 10,000	25	165,268	65.80%
	Over 10,000	45	978,615	89.07%
	OK Total	208	1,367,470	79.05%
TX	Under 500	32	8,565	9.47%
	500 to 1,000	27	20,518	14.82%
	1,000 to 2,000	55	83,471	29.06%
	2,000 to 3,000	48	121,195	45.20%
	3,000 to 5,000	63	254,779	45.59%
	5,000 to 10,000	77	554,783	65.25%
	Over 10,000	227	7,112,157	87.15%
	TX Total	529	8,155,468	82.88%

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